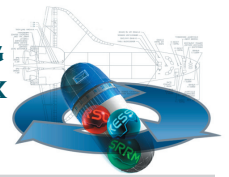# RISK TOOL SUITE
FOR ADVANCED DESIGN

ENGINEERING FOR COMPLEX SYSTEMS

CHALLENGES

NASA needs effective and efficient evaluation of full breadth of risks for a complex program, project, or technology effort that explicitly includes improved risk insight for management and technical decision-making. Challenges include:

- capturing risk assumptions, mitigations, results generated during the design, development and deployment of a complex system

- development of a sufficiently agile system design and trade capability for its wide array of mission types, applications and time scales

- comparison of highly disparate architectural and technology options

- Expanding emerging collaborative model-based design and decision structures to include the full breadth of associated risks

- Continued development and deployment of discrete system analysis capability supporting technology investments in Code T/MSM

OBJECTIVES

This product has two primary goals:

- capabilities to allow more effective evaluation of program and project technology risks and risk trade-off with performance, cost and schedule

- enable effective integration of risk measures into design, build, and operate decision-making

CUSTOMERS & COLLABORATORS

Mars Technology Program
Mars Smart Lander Project
Code Q
Agency design centers
Jupiter Icy Moon Explorer

CONTACT INFORMATION

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IMPACTS

The Risk Tool Suite for Advanced Design (RTSAD) product will:

- Develop the capability to fully characterize and visualize risks early and consistently for NASA missions

- Provide a broad design space that includes a variety of risk types including programmatic, technology, human/organization, and software and hardware technical risk.

- Focus on risk measures for the early phases of the NASA project lifecycle, but ensure scalability to the implementation and later project phases

- Use risk to explore various project trade spaces and as a criteria for design selection and optimization

- Provide risk-based design capabilities that are sufficiently agile and responsive to be useful in the assessment of early designs in rapid design environments

- Support risk decision-making in collaborative design environments for complex spacecraft systems.

TECHNOLOGIES USED

RTSAD will develop and provide access to a number of components (tools, processes and data sources). These components are of three types: Data Gathering (Access to various databases of historical risks, mishaps, failure reports, etc. is provided, along with intelligent search capabilities), Model Building (Fault Trees, Performance Models, PRAs, cost/benefit models, constraints, etc.), Model Exploration (Optimization, sensitivity, simulation, what-if scenarios, etc.). These components will be available in an integrated fashion in a collaborative environment for decision-making support for technologists, managers and engineers, tested with real projects and other space flight missions and technologies.

By applying risk management as an active element throughout the NASA product life-cycle, rather than an exercise on a point design, higher quality (and potentially more cost-effective) products and programs can be achieved.

Each point represents a selection of risk mitigations, located by its cost (horizontal position) and benefit (vertical position).